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Puskar et al.

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(54) **ROTATING DISPLAY DEVICE HAVING WIRING HARNESS RETENTION MEMBER**

(75) Inventors: **Michael Paul Puskar**, Carnegie Borough, PA (US); **William Michael Randal**, Baldwin Township, PA (US); **Thomas Alan Whitaker**, North Huntingdon, PA (US)

(73) Assignee: **Eaton Corporation**, Cleveland, OH (US)

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(51) **Int. Cl.**
H01R 39/00 (2006.01)

(52) **U.S. Cl.** **439/13**; 439/164

(58) **Field of Classification Search** 439/164, 439/11, 13, 18–28

See application file for complete search history.

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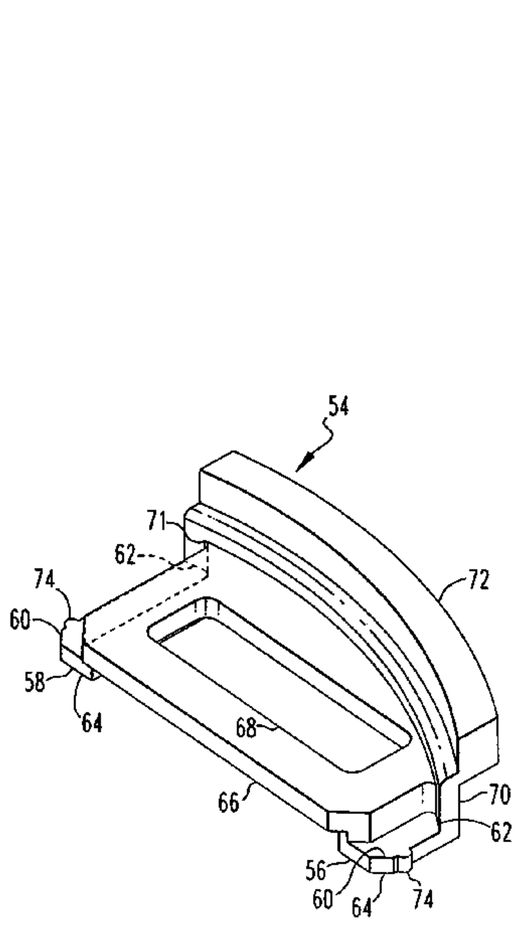
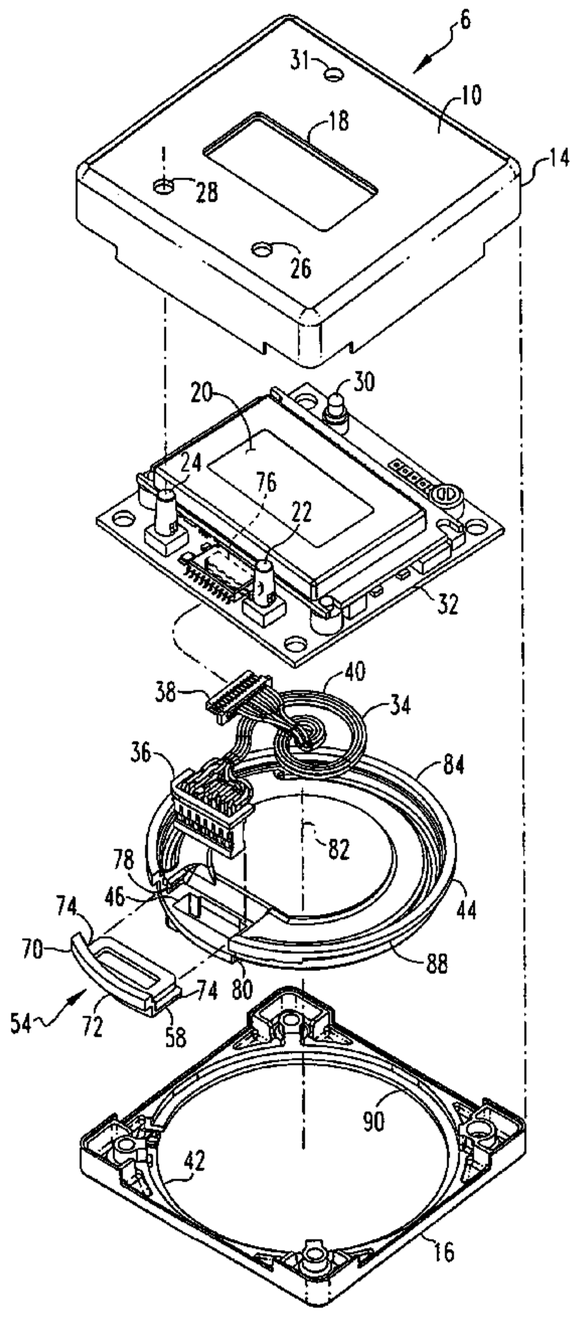
Primary Examiner—Tho D Ta
Assistant Examiner—Travis Chambers
(74) *Attorney, Agent, or Firm*—Martin J. Moran

(57) **ABSTRACT**

A rotating display device enables a user to view, in a variety of viewing orientations, a value of an electrical apparatus to which the rotating display device is electrically and mechanically connected. The rotating display device includes a housing having a first half and a second half, a display for displaying the value, a rotating member disposed within the second half, a retention member slideably received into the rotating member, and a wiring harness secured to the rotating member by the retention member.

9 Claims, 6 Drawing Sheets





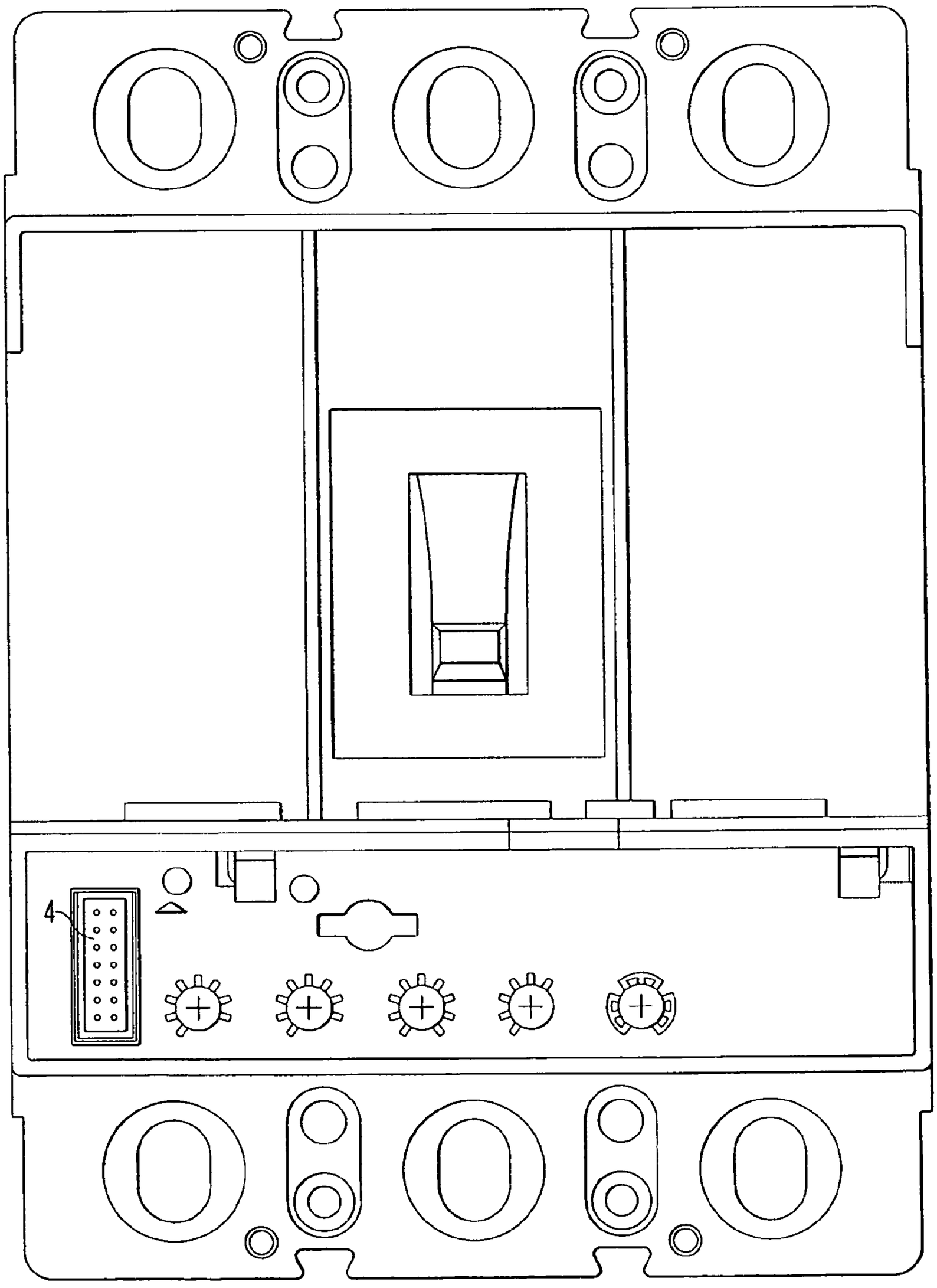


FIG. 1
PRIOR ART

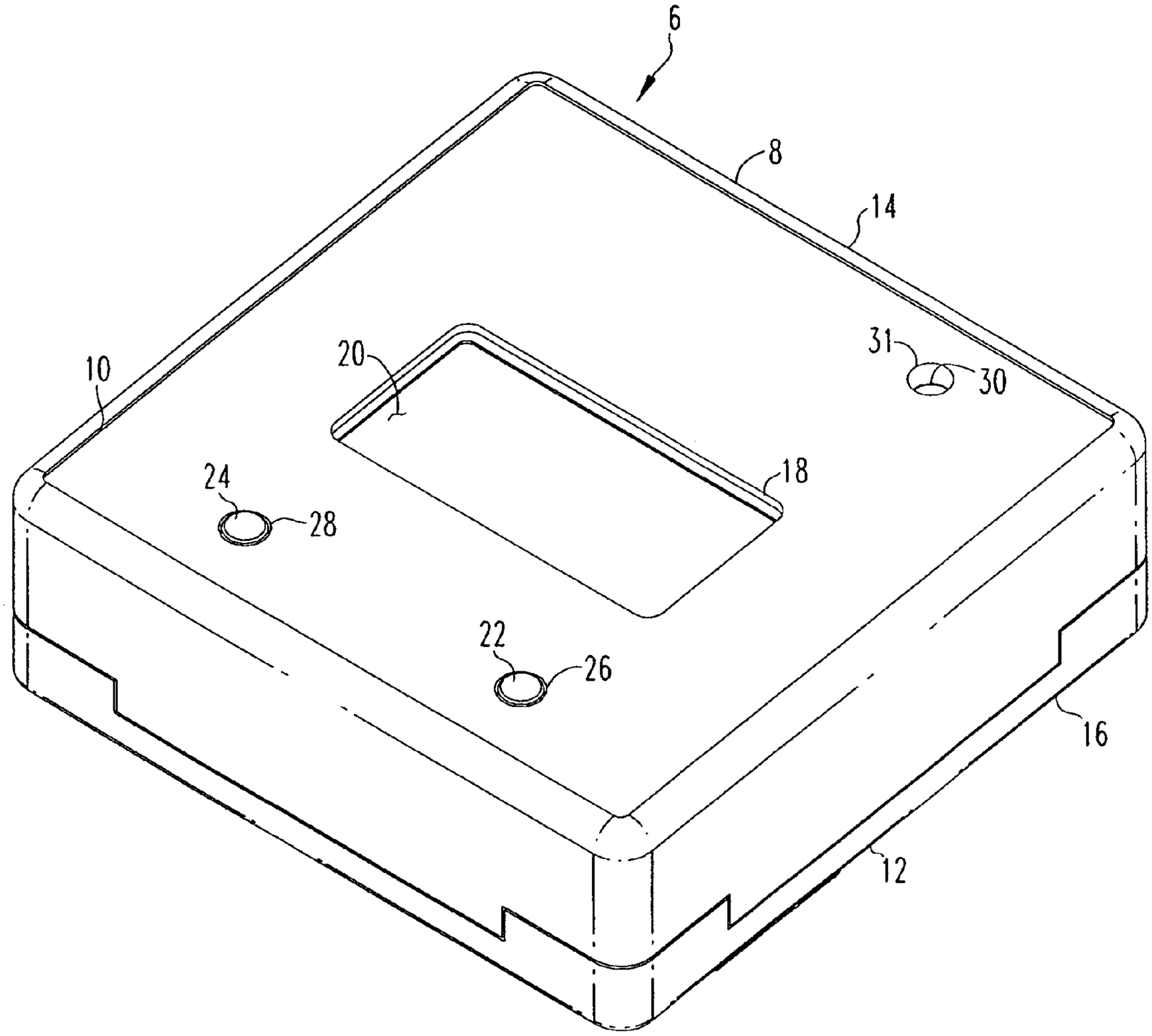


FIG.2

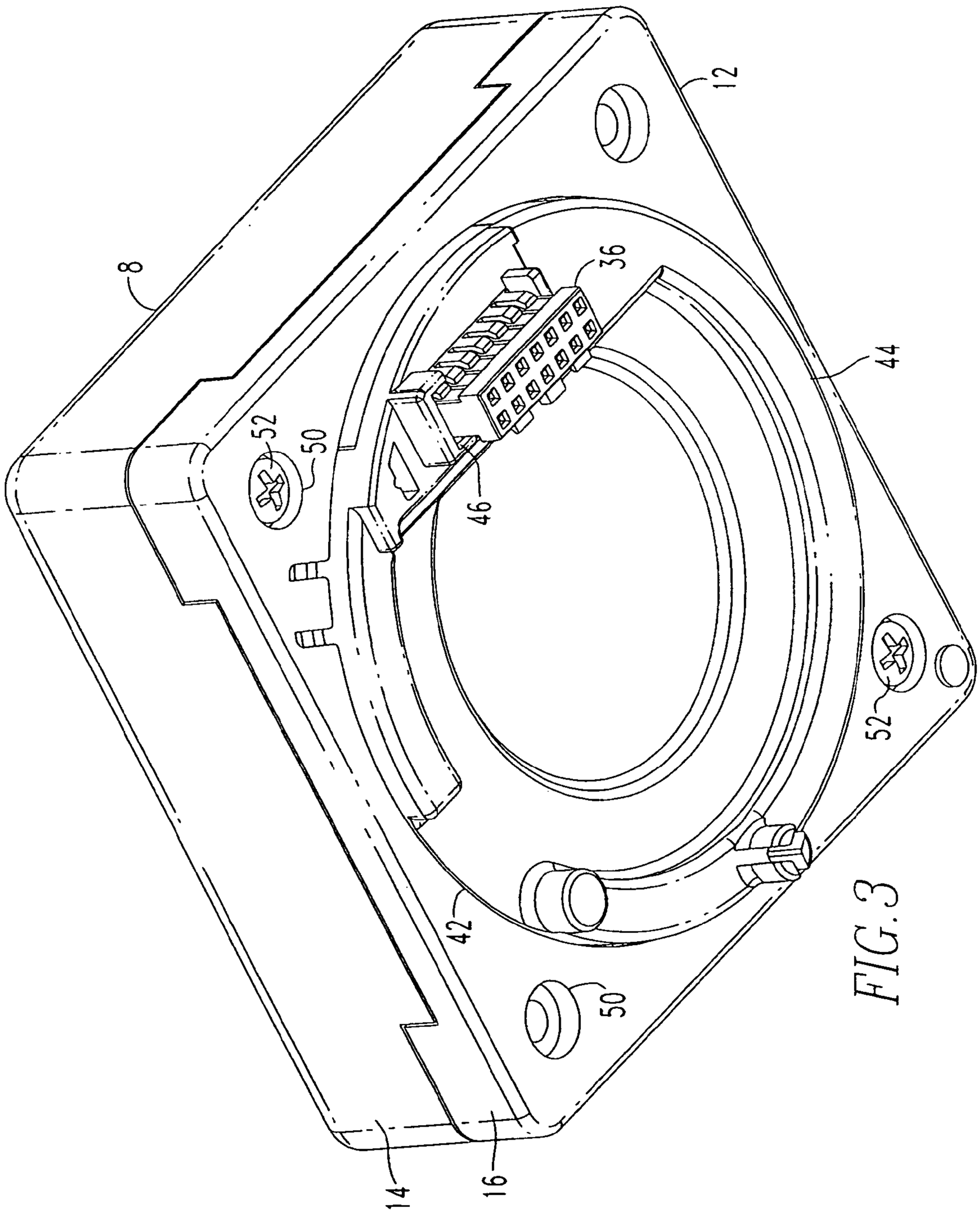


FIG. 3

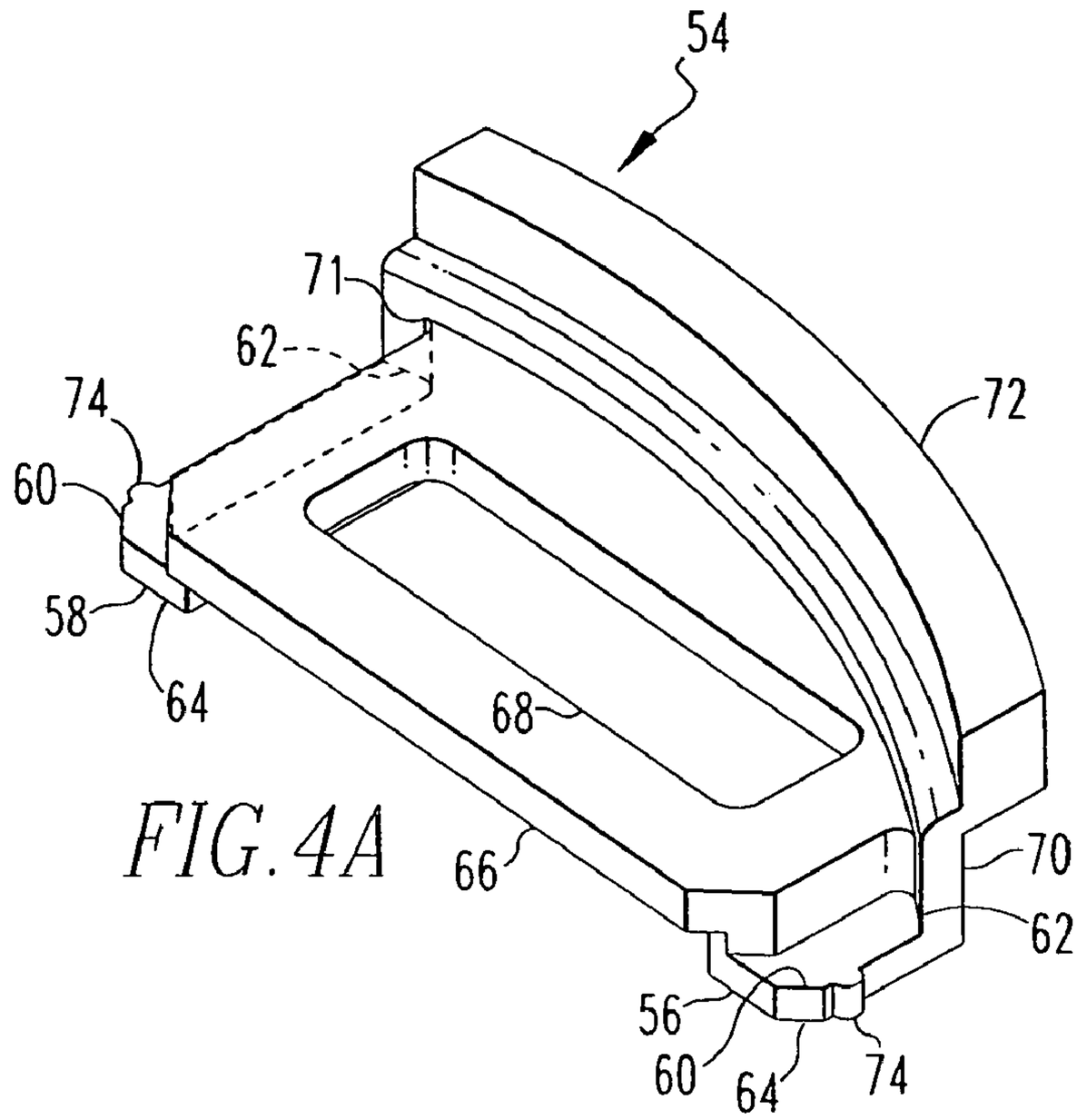

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FIG. 4A

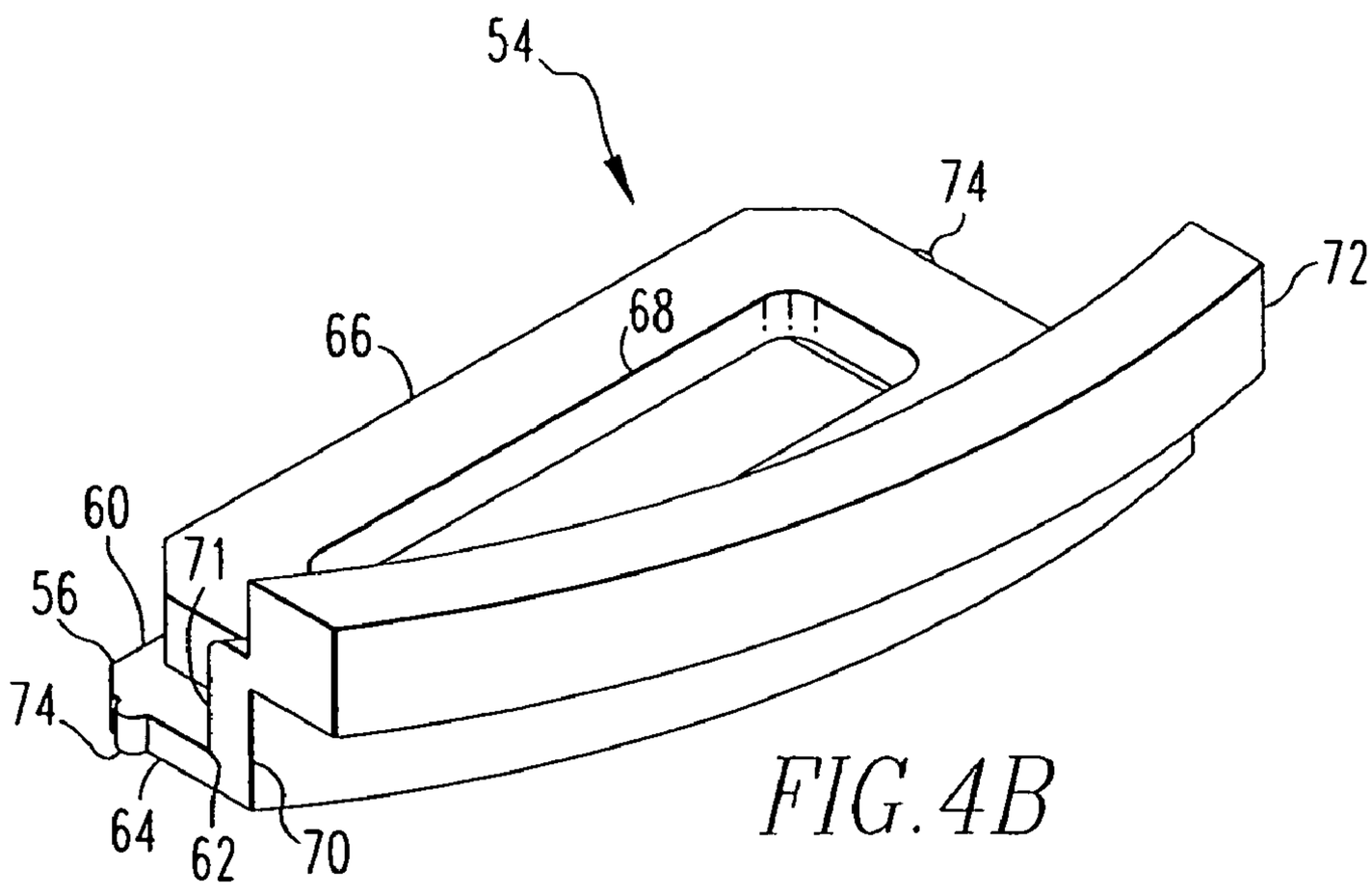
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FIG. 4B

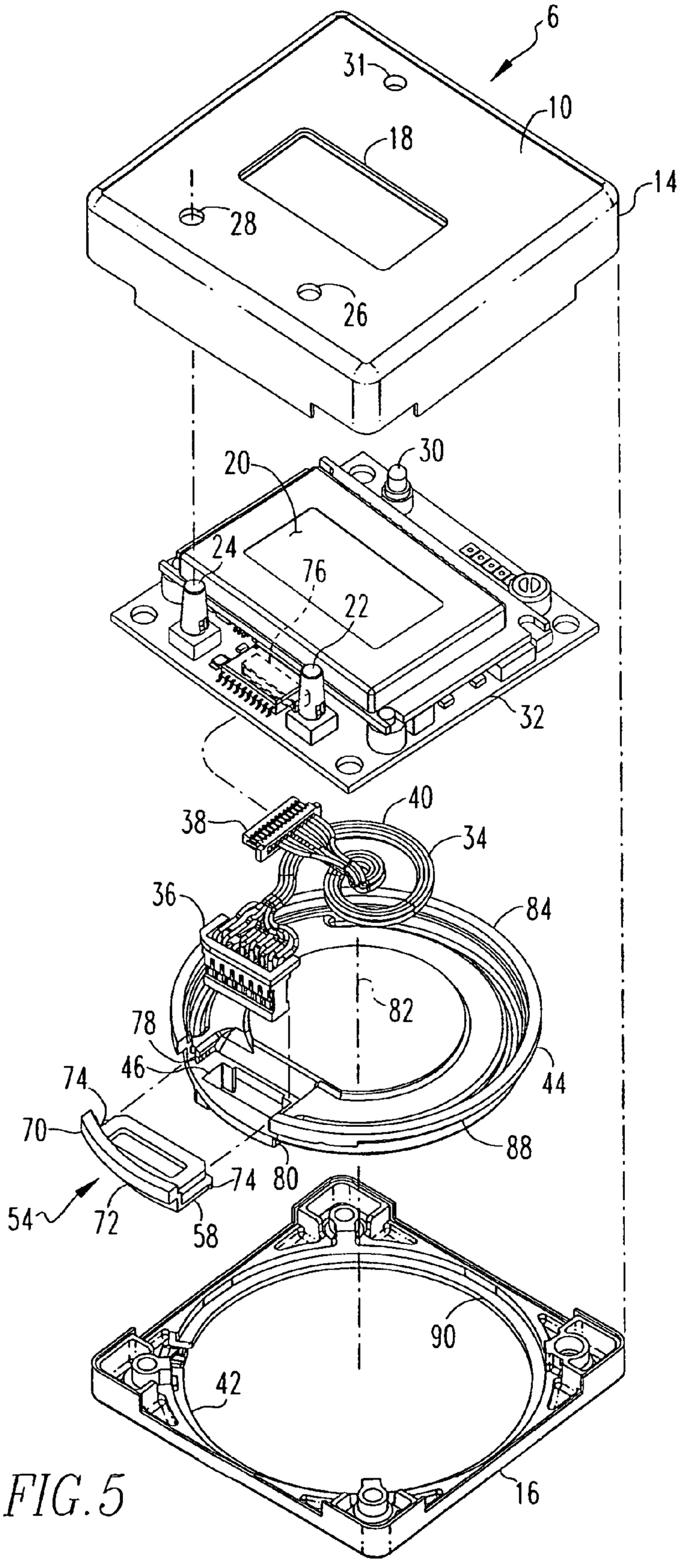
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FIG. 5

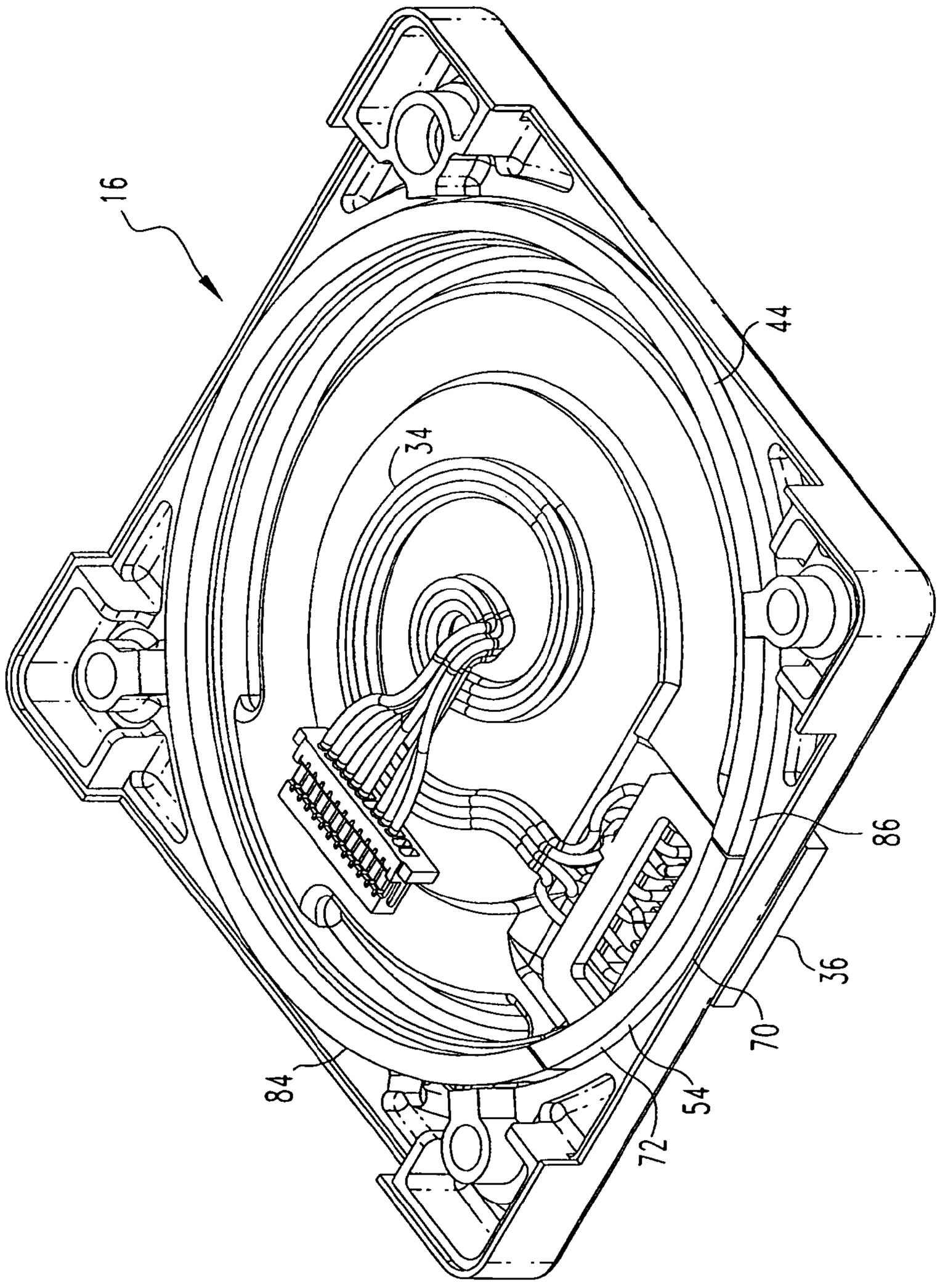

FIG. 6

ROTATING DISPLAY DEVICE HAVING WIRING HARNESS RETENTION MEMBER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates generally to an electrical apparatus and, more particularly, to a display device for receiving and displaying a value from an electrical apparatus. The invention also relates to a retention member that secures a wiring harness that is disposed within a display device.

2. Background Information

Displaying operating parameters (e.g., without limitation, voltage; electrical current; frequency) provides one way for a user to ensure that an electrical apparatus is operating properly. Accordingly, electrical apparatus including, for example, electrical switching apparatus, such as circuit switching devices and circuit interrupters (e.g. without limitation, circuit breakers, contactors, motor starters, motor controllers and other load controllers), often include a connector for outputting a value. The value outputted on the connector is typically indicative of one or more operating parameters. Circuit breakers, such as the low voltage circuit breaker **2**, shown in FIG. **1**, exemplify one type of electrical apparatus that may include such a connector **4**.

However, electrical apparatus, including circuit breakers, are often mounted or disposed in a wide variety of orientations with the position of the display device display being dictated by such orientation and the corresponding orientation of the connector on the electrical apparatus. The varying orientations of the electrical apparatus make it difficult to read the value displayed on the display when the electrical apparatus is disposed in any orientation other than a vertical one. For example, circuit breakers can often be mounted sideways or in an inverted orientation, thereby requiring the display device's display to be oriented in a corresponding sideways or inverted orientation. This results in the displayed value being displayed in an improper orientation, thereby making it difficult to be accurately read or interpreted by a user.

SUMMARY OF THE INVENTION

These needs and others are met by embodiments of the invention, which provide a rotating display device for viewing a value in a variable viewing orientation.

In accordance with one aspect of the invention, a retention member is for use with a rotating display device. The rotating display device includes a rotating member disposed therein. The rotating member has a first groove and a second groove that are structured to slideably receive the retention member. The retention member includes: a first flange and a second flange, each of the first and second flanges has a first surface and a second surface, the first flange being structured to be slideably received into the first groove and the second flange being structured to be slideably received into the second groove; and a first web and a second web, the first web extends from the first surface of the first flange to the first surface of the second flange, the second web extends from the second surface of the first flange to the second surface of the second flange.

In accordance with another aspect of the invention, a rotating display device includes: a housing having a first half and a second half; a display for displaying the value, the display being disposed within the first half; a rotating member disposed within the second half; a retention member slideably received into the rotating member; and a wiring harness secured to the rotating member by the retention member.

In accordance with another aspect of the invention, an electrical apparatus includes: an enclosure having a surface; a port disposed on the surface of the enclosure, the port being structured to output a value; and a rotating display device coupled to the port. The rotating display device is structured to receive the value and display the value in a variable viewing orientation, the rotating display device includes: a housing having a first half and a second half; a display structured to display the value, the display being disposed within the first half; a rotating member disposed within the second half; a retention member, the retention member is slideably received into the rotating member; and a wiring harness secured to the rotating member by the retention member.

BRIEF DESCRIPTION OF THE DRAWINGS

A full understanding of the invention can be gained from the following description of the preferred embodiments when read in conjunction with the accompanying drawings in which:

FIG. **1** is a top plan view of a low voltage circuit breaker;

FIG. **2** is an isometric view of a rotating display device including a display in accordance with an embodiment of the invention;

FIG. **3** is an isometric view of the connector side of the rotating display device of FIG. **2**;

FIGS. **4**A and **4**B are isometric views of one embodiment of the retention member of FIG. **3**;

FIG. **5** is an exploded isometric view of the rotating display device of FIG. **2**; and

FIG. **6** is an isometric view of the second half of the rotating display device of FIG. **2**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is described in association with a display device for a low voltage circuit breaker, although the invention is applicable to a wide range of electrical apparatus, such as, for example, electrical switching apparatus.

Directional phrases used herein, such as, for example, upper, lower, left, right, vertical, horizontal, top, bottom, above, beneath, clockwise, counterclockwise and derivatives thereof, relate to the orientation of the elements shown in the drawings and are not limiting upon the claims unless expressly recited therein.

As employed herein, the phrase "slideably receives" or variations thereof shall mean that a part is adapted to receive another part which slides into it.

As employed herein, the statement that two or more parts are "coupled" together means that the parts are joined together either directly or joined through one or more intermediate parts.

As employed herein, the term "number" means one or an integer greater than one (i.e., a plurality).

As employed herein, the term "wiring harness" or variations thereof shall mean a number ports or connectors that are electrically connected by a number of conductors.

As employed herein, the term "lip" or variations thereof shall mean a projecting edge.

As employed herein, the term "groove" or variations thereof shall mean a channel or depression.

As employed herein, the term "mechanical fastener" or variations thereof shall refer to any suitable fastening, connecting or tightening mechanism including, but not limited to, screws, bolts, and the combination of bolts and nuts.

As employed herein, the term "variable viewing orientation" shall refer to the ability of the display for a rotating display device to be rotated, for example, to a variety of viewing orientations, in order to permit a user to accurately view and interpret the value displayed thereon even when the connector of the electrical apparatus to which it is coupled is disposed in a different or non-standard orientation.

FIG. **2** depicts a rotating display device **6** that receives and displays a value (e.g., without limitation, operational parameter; setpoint; served value) of an electrical apparatus. As will be discussed in further detail below, the rotating display device **6** is mechanically coupled and electrically connected to the electrical apparatus by the connector **4** (FIG. **1**) that is located on the electrical apparatus. The rotating display device **6** includes a housing **8** having a first side **10** and a second side **12**. The rotating display device **6** further includes a first half **14** and a second half **16**. Located on the first side **10** of the housing **8** is a first aperture **18** in which a display **20** is disposed. The display **20** displays (outputs) the value that is received from the electrical apparatus. In one embodiment, the display **20** displays the value in a digital format. However, this is not meant to be limiting since any suitable alternative display format including, but not limited to, an analog display may also be employed.

As can be seen from FIG. **2**, the first side **10** of the housing **8** further includes a first control button **22** and a second control button **24**. The first control button **22** extends through a second aperture **26** while the second control button **24** extends through a third aperture **28**. The control buttons **22**,**24** are an optional feature designed to permit the user to control the display **20**. For example, the control buttons **22**,**24** may permit the user to switch the value being displayed (e.g. current; voltage) or to change the units in which the value is displayed (e.g., amps; milliamps). The housing **8** may also include a Light Emitting Diode (LED) **30** that indicates, for example, whether the rotating display device **6** is electrically connected to the electrical apparatus. The LED **30** is positioned within a fourth aperture **31** that is located on the first side **10** of the housing **8**. The display **20**, control buttons **22**,**24**, and LED **30** are disposed and electrically connected to a printed circuit board **32** (shown in FIG. **5**) that is located between the first and second housing halves **14**,**16**. As will be discussed in further detail below, the printed circuit board **32** is electrically connected to the electrical apparatus by a wiring harness **34** (shown in FIG. **5**) having first and second connectors **36**,**38** (shown in FIG. **5**) that are electrically connected by a number of conductors **40** (shown in FIG. **5**). Specifically, the printed circuit board **32** is mechanically coupled and electrically connected to the second connector **38** of the wiring harness **34**.

Referring to FIG. **3**, the second side **12** of the housing **8** includes an aperture **42** in which a rotating member **44** is disposed. The rotating member **44** has an aperture **46** that is structured to receive the first connector **36** of the wiring harness **34**. As shown, the first connector **36** extends from the second side **12** of the housing **8** when the first connector **36** is positioned within the aperture **46** of the rotating member **44**. The first connector **36** is structured to be mechanically coupled and electrically connected to the connector **4** (FIG. **1**) that is located on the electrical apparatus thereby electrically connecting the printed circuit board **32** to the electrical apparatus. The second side **12** of the housing **8** further includes a number of apertures **50** that are structured to receive mechanical fasteners **52** which secure the second housing half **16** to the first housing half **14**.

Referring to FIG. **5**, in order to ensure that the conductors **40** of the wiring harness **34** do not interfere with the various internal components of the rotating display device **6** and that the first connector **36** does not dislodged from the rotating member **44** when the rotating display device **6** is coupled to the electrical apparatus, a retention member **54** (see FIGS. **4**A, **4**B, **5**, and **6**) is structured to be slideably received into the rotating member **44**. The retention member **54** not only acts as a strain relief and a guide for the conductors **40** of the wiring harness **34**, but also secures the first connector **36** to the rotating member **44**.

As can be seen from FIGS. **4**A and **4**B, the retention member **54** includes a first flange **56** and a second flange **58**. Each of the first and second flanges **56**,**58** has corresponding first, second, and third surfaces **60**,**62**,**64**, as best shown with the first flange **56**. Extending from the first surface **60** of the first flange **56** to the first surface **60** of the second flange is a first web **66**. The first web **66** includes an aperture **68** that is located, for example, at about the center of the first web **66**. Extending from the second surface **62** of the first flange **56** to the second surface **62** of the second flange **58** is a second web **70**. The first web **66** is connected to the second web's inner surface **71**. In the example embodiment depicted in FIGS. **4**A and **4**B, the second web **70** is substantially arcuate in shape and includes a substantially arcuate lip **72**. The first web **66** extends from the first flange **56** to the second flange **58** in a direction substantially perpendicular to an axis **82** (FIG. **5**) of the rotating member **44** (see FIG. **5**). Each of the first and second flanges **56**,**58** also includes a protrusion **74** extending therefrom. It should be noted, however, that despite FIGS. **4**A and **4**B showing only one protrusion **74** extending from each of the first and second flanges **56**,**58**, a first and second flange **56**,**58** having two or more protrusions **74** extending therefrom falls within the scope of this invention. The protrusions **74** are structured to securely couple the retention member **54** to the rotating member **44** when the retention member **54** is slideably received into the rotating member **44**.

As can be seen from FIG. **5**, the printed circuit board **32**, the wiring harness **34**, and the rotating member **44** are all disposed between the first and second halves **14**,**16** of the housing **8**. The display **20** is inserted through the first aperture **18** that is located on the first side **10** of the housing **8** while the first control button **22** and the second control button **24** as well as the LED **30** are inserted through the respective second, third, and fourth apertures **26**,**28**,**31**, which are also located on the first housing side **10**. As employed, the circuitry (not shown) of the printed circuit board **32** receives the value from a connector **76** that is located on the surface of the printed circuit board **32** that is adjacent to the rotating member **44**. The connector **76** is mechanically coupled and electrically connected to the second connector **38** of the wiring harness **34** which, as stated above, is electrically connected to the first connector **36**.

Continuing to refer to FIG. **5**, the first connector **36** of the wiring harness **34** is structured to be received into the aperture **46** that is located on the rotating member **44**. When positioned within the aperture **46** of the rotating member **44**, the first connector **36** of the wiring harness **34** is secured to the rotating member **44** by the retention member **54** that is slideably received into the rotating member **44**. Specifically, the first and second flanges **56**,**58** of the retention member **54** are structured to be slideably received into a first groove **78** and a second groove **80** that are located on the rotating member **44**, respectively. The first and second grooves **78**,**80** extend in a direction substantially perpendicular to an axis **82** of the rotating member **44**. As stated above, each of the first and second flanges **56**,**58** of the retention member **54** includes a number of protrusions **74** that secure the retention member **54** to the rotating member **44**. The combination of the rotating

member **44**, the retention member **54** and the first connector **36** of the wiring harness **34**, is received into the aperture **42** that is located on the second half **16** of the housing **8**. The second housing half **16** is secured to the first housing half **14** by a number of mechanical fasteners **52** (see FIG. **3**) that are inserted through the apertures **50** that are located on the second side **12** of the housing **8**. As can be seen from FIG. **5**, the printed circuit board **32** is secured between the first and second housing halves **14**,**16** by the mechanical fasteners **52** (FIG. **3**). By securing the printed circuit board **32** to the first and second housing halves **14**,**16**, the display **20** rotates with the housing **8** thereby permitting a user to view the display **20** in a variety of viewing orientations.

FIG. **6** shows the second housing half **16** having disposed therein the rotating member **44**. As can be seen, the rotating member **44** includes the first connector **36** of the wiring harness **34** which is secured to the rotating member **44** by the retention member **54**. The rotating member **44** has a lip **84** (as best shown in FIG. **5**) that extends along a portion of the perimeter of the rotating member **44**. When the retention member **54** is secured to the rotating member **44**, the lip **72** of the second web **70** of the retention member **54** in addition to the lip **84** of the rotating member **44** form a complete lip **86** that extends along substantially the entire perimeter of the rotating member **44**. The complete lip **86** has a first surface **88** (see FIG. **5**) that is positioned adjacent to an edge **90** (see FIG. **5**) of the rotating member **44** which secures the rotating member **44** to the second housing half **16** when the second housing half and the printed circuit board **32** are secured to the first housing half **14**.

While specific embodiments of the invention have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements disclosed are meant to be illustrative only and not limiting as to the scope of the invention which is to be given the full breadth of the claims appended and any and all equivalents thereof.

What is claimed is:

1. A rotating display device for displaying a value in a variable viewing orientation, said rotating display device comprising:

a housing having a first half and a second half;

a display for displaying said value, said display being disposed within said first half;

a rotating member disposed within said second half;

a retention member slideably received into said rotating member;

a wiring harness secured to said rotating member by said retention member;

wherein said wiring harness comprises a first connector and a second connector that are electrically connected by a number of conductors; and

wherein said rotating member comprises a first groove and a second groove; and wherein said retention member comprises a first flange and a second flange, each of said first and second flanges has a first surface and a second surface, said first flange being slideably received into said first groove and said second flange being slideably received into said second groove, and a first web and a second web, said first web extends from said first surface of said first flange to said first surface of said second flange, said second web extends from said second surface of said first flange to said second surface of said second flange.

2. The rotating display device according to claim **1**, wherein each of said first and second flanges has a number of protrusions extending therefrom, said protrusions securing said retention member to said rotating member.

3. The rotating display device according to claim **1**, wherein said rotating member has an axis; and wherein said first web extends from said first flange to said second flange in a direction substantially perpendicular to said axis of said rotating member.

4. The rotating display device according to claim **1**, wherein said rotating member has an aperture that receives said first connector of said wiring harness.

5. The rotating display device according to claim **4**, wherein each of said first and second flanges has a third surface; and wherein said first connector of said wiring harness is positioned within said aperture and substantially adjacent to said third surface of each of said first and second flanges.

6. An electrical apparatus comprising:

an enclosure including a surface;

a port disposed on said surface of said enclosure, said port being structured to output a value;

a rotating display device coupled to said port, said rotating display device structured to receive said value and display said value in a variable viewing orientation, said rotating display device comprising:

a housing having a first half and a second half;

a display structured to display said value, said display being disposed within said first. half;

a rotating member disposed within said second half;

a retention member, said retention member is slideably received into said rotating member;

a wiring harness secured to said rotating member by said retention member;

wherein said wiring harness comprises a first connector and a second connector that are electrically connected by a number of conductors; and

wherein said rotating member further comprises a first groove and a second groove;

and wherein said retention member comprises a first flange and a second flange, each of said first and second flanges has a first surface and a second surface, said first flange slideably received into said first groove and said second flange slideably received into said second groove, and a first web and a second web, said first web extends from said first surface of said first flange to said first surface of said second flange, said second web extends from said second surface of said first flange to said second surface of said second flange.

7. The electrical apparatus according to claim **6**, wherein each of said first and second flanges has a number of protrusions extending therefrom, said protrusions securing said retention member to said rotating member.

8. The electrical apparatus according to claim **6**, wherein said rotating member has an aperture that receives said first connector of said wiring harness.

9. The electrical apparatus according to claim **8**, wherein each of said first and second flanges has a third surface; and wherein said first connector of said wiring harness is positioned within said aperture and substantially adjacent to said third surface of each of said first and second flanges.

* * * * *